Is low family resilience and previous mental illness vulnerability factors for post-disaster child Post Traumatic Stress Disorder?

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Abstract

INTRODUCTION

Research on child emotional health in the post-natural disaster environment has attempted to investigate complex outcome models inclusive of both disaster-related factors such as exposure as well as psychological constructs inherent to the individual. The latter including coping style [1], causal attribution [2], threat perception [3] and high trait anxiety [3,4]. This is consistent with contemporary formulations of child and adolescent mental health that emphasise interactions between proximal factors such as peer interactions and distal factors such as the individual's innate resilience and vulnerability. Few post-disaster studies have included family resilience as a potential variable that may influence the individual's vulnerability to Post Traumatic Stress Disorder (PTSD), or indirectly moderate other significant factors such as their threat perception or social connectedness.

An ecological approach to resilience in children takes into account the protective mechanisms of the child-environment interaction [5] including the family and the broader ecology. Family resilience can be defined as the ability of a family to respond positively to an adverse situation and emerge from the situation feeling strengthened, more resourceful, and more confident than its prior state [6] (Simon, Murphy, & Smith, 2005, p. 427). A number of models of family resilience have been proposed. Using a systems approach, Walsh [7] proposed three characteristics of resilient families: belief systems, organisational patterns and communication/problem solving. Belief systems encompass the capacity to make meaning from adversity, a positive outlook, and transcendence and spirituality (e.g. faith, rituals, purpose, and appreciation). Organisational patterns include the flexibility to adapt and restabilise, connectedness with others, and economic resources. Communication/problem solving includes clear consistent information, emotional expressiveness and collaborative decision making. In contrast, Lietz [8] found a non-sequential process model best fitted the experience of resilient families, and emphasised differing focus of the family at different stages following adverse events including survival, adaptation, acceptance, growing stronger, and helping others. Family strengths, consistent with the characteristics identified by Walsh, are drawn on at different stages. Both of these models

incorporate a sense of belonging and connectedness rather than isolation, and process and resources rather than being overwhelmed.

We hypothesise major disasters can cause extensive disruption to family processes as both the individual members of the family and the family unit as a whole respond to the crisis situation. It is clear then that the resilience capabilities of families can act as either a risk for maladaptation or be protective and support optimal adaptation during such adversity [9]. To date, there is a paucity of empirical data on family resilience following natural disasters and its relationship to the development of PTSD in children following natural disasters. Our aim was to investigate whether parent-report of family resilience predicted children's post-disaster psychological functioning, specifically whether low family resilience was associated with elevated levels of post-disaster PTSD and general emotional symptoms. Further, whether family resilience independently contributed to a multivariate model of PTSD that was inclusive of distal PTSD-related factors such as community connectedness and proximal factors such as event-related exposure and threat perception and whether this was a main effect and/or moderated other significant factors in the final model.

Method

North Queensland, Australia is a tropical cyclone prone area. Cyclone Larry developed for several days in the Coral Sea and then crossed the coast with an estimated intensity of a Category 5 tropical Cyclone. Consistent with a very severe cyclone regional towns experienced between 15% to 99% infrastructure damage and the financial implications of widespread crops destruction meant the livelihood of residents was impaired for many months post-disaster. The total insurance cost was estimated at $AUS 360 million. Whilst physical injury was common, in many cases occurring during the clean-up phase not the cyclone, no lives were lost.

Procedure

Following the cyclone the government departments of Queensland Health and Education Queensland undertook mental health screening of school students to identify individuals with a persisting disaster-related mental health problem. This procedure has been previously conducted following natural disasters in Australia and met with parent and teacher approval [4,10]. For logistical reasons screening took place 3 months after the Cyclone. Screening was a classroom activity, only proceeded with informed, signed, parent consent and was conducted by school counsellors. Teachers remained with their class during the activity. All questions were read to students. Questions were followed by an opportunity for students to discuss their cyclone experience with their class, teacher and counsellor.

Participants

The sample was 568 individuals, a subgroup of public, elementary school children nested within the larger cohort of 804 elementary school children, whose parents were asked and consented to complete the family resilience questionnaire. Of this group 441 parents (77.6%) completed the family resilience measure. Questionnaire non-completers generally did not answer any family resilience questions and so data recovery, for example using mean item substitution, was not possible. The children of non-participating families did not significantly differ from participating family children on gender, age, or measures of the child's general or post-traumatic psychopathology. In participating families 55.2% of the sample was female; the average age was 10.2 years (SD 1.3, range 8 to 15 years). Participants were approximately equally divided across the four primary school years. Given understandable consumer sensitivity concerning data collection in a post-diaster environment individual race and socioeconomic class data is not available. However, relative to Queensland as a whole, people living with relative socioeconomic disadvantage (36% versus 20%) and Indigenous Australians (7.7% versus 2.3%) were over-represented in the disaster area [11].

Measures

The Family Resilience Measure (FRM) [12] is a 9-item, parent-report questionnaire that begins with the statement, “How well do these match the way things are in your family?” The FRM focuses on the family dealing with adversity by getting on together, talking about worries, being there for each other, accepting one another and counting on relatives “when things get tough”. The remaining questions deal with family traditions such as undertaking activities together and practical family functioning like spending for food and clothing before “buying other things”. Parents rated the nine FRM statements on a five-point Likert scale on whether they agreed “not at all” to “very much”. The range of possible scores is 9 to 45, with higher scores indicating higher family resilience. Cronbach’s alpha value of the FRM for this sample was 0.83 – suitable for research purposes.

The PTSD Reaction Index (PTSD-RI) [13] is a measure of PTSD symptoms in children and adolescents, extensively used in natural disasters setting [14]. Traumatic event specificity is created by including the trauma designation, in this case ‘the cyclone’ in the wording of questionnaire items. The PTSD-RI is a self-report measure and has 20 items. Respondents apply a 5 point likert-like scale to validate the presence of symptoms over the preceding month. The PTSD-RI yields a total PTSD-RI score as well as doubtful, mild, moderate, severe and very severe PTSD categories. The PTSD-RI has acceptable psychometric properties for research use [1,3,4,13] and with this sample the Cronbach’s alpha value was 0.90.

The Strengths and Difficulties Questionnaire (SDQ) [15, 16] parent version, emotional subscale, was included to screen for non-PTSD internalising psychopathology. The emotional subscale consists of 5 questions relating to feelings of unhappiness, worries, fears, feeling nervous and somatic complaints. Items are rated on a three point scale: Not True, Somewhat True, or Certainly True and a subscale total score generated. Normative Australian data is available for the SDQ and subscales [17]. The SDQ has psychometric properties that make it suitable for research purposes [16] (see sdqinfo.com) and the internal consistency (Cronbach’s alpha) for this sample was 0.81.

The child screening questionnaire including items concerning the child's disaster experience, perception of threat, and questions relating to the cyclone aftermath and recovery. Exposure questions were self-report, Yes/No format questions such as, "Did you see flying debris?"; "Was your home damaged?" and "Did your home lose part of its roof?" Perception of threat was assessed by two questions, "Did you think you were going to die during the cyclone?" and "Did you think a family member might die during the cyclone?" A single item measured how frightened children felt on the day of cyclone on a 10-point scale with 10 indicating "extremely frightened".

Finally children completed a brief, 4 question measure of community connectedness by indicating their agreement with statements concerning their contact with friends, trust in others, sense of belonging and participation in school activities [18]. A total community connectedness score was created; children in the lowest 10% of the connectedness distribution were categorized as "low child connectedness"

Statistic analysis

The FRM was analysed as a continuous variable (total score) or a case (abnormal) versus non-case nominal variable. Similarly the PTSD-RI total score was analysed as a total score or a categorical "severe or very severe PTSD" versus all other responses. The latter was used in a logistic regression model of the predictors of PTSD. with all other classifications. For child connectedness children in the lowest 10% of the connectedness distribution were categorized as "low child connectedness". We used chi-squared tests for pairs of categorical variables, two-tailed t-tests for categorical with continuous variables, and correlation coefficients for pairs of continuous variables. We took account of potential confounders, such as type of school, and possible effect modification by age and sex. Odds ratios (crude and adjusted) were calculated by logistic regression. There were fewer than 10% missing data for any variable; we imputed missing data using Full Information Maximum Likelihood estimation. Means, standard deviations and correlation coefficients in the imputed dataset were near-identical to

those in the dataset with missing data. Analyses were conducted on the dataset with imputation using SPSS 15.0 for Windows (Statistical Package for Social Sciences, SPSS Inc.), State v9.2 (STATA Corp.) and AMOS 7.0 (Arbuckle, 1983-2006).

Results

Participants experienced significant exposure to Cyclone Larry including reporting seeing 'flying debris' (341/438, 77.8%), experiencing damage to their home such as roof damage (165/452, 36.5%) or loss of their roof (17/447, 3.8%) and many perceived they may have died during the cyclone (109/425, 25.6%). Consistent with this level of exposure most of the sample experienced some PTSD symptoms, 64 (11.3%) individuals were in the severe to very severe PTSD category on the PTSD-RI. On the SDQ-Emotional subscale the mean score was 1.66 (2.16) with 56 (12.5%) participants reaching 'case' criteria on this subscale, however, the mean emotional symptoms score reported in this sample was less than that reported in an Australian community sample by Mellor [17]: SDQ-Em mean score 2.3 (*SD* = 2.0) in 7-10 year olds, 2.0 (*SD* = 2.1) in 11-13 year olds.

The mean Family Resilience score was 40.25 (*SD* = 4.40, range 22 - 45). Applying published cut-off scores, 53 families (28.6%) scored in the poor family resilience range while 71.4% scored in the good/very good range. This sample had significantly more respondents in the good/very good levels of family resilience compared with the published sample (tz = -9.65, p < .001) [12].

Bivariate associations with family resilience.

There was no significant relationship between the family resilience total score and child's age (t = -0.615, df 439, p = 0.538) or school grade (F = 0.892, df 3, p = 0.446). There was a trend for a lower family resilience report by parents of female student participants (t = 1.753, df 439, p = 0.081). A lower family resilience score was associated with meeting case criteria for child emotional problems on the SDQ (t = -2.919, df 425, p = 0.003) and longer duration of child mental health difficulties (F =

5.801, df 408, $p = 0.000$). Family resilience total score was not associated with child PTSD category ($t = -0.340$, df 439, $p = 0.734$) or child self-report of threat perception to themself ($t = 0.367$, df 407, $p = 0.714$). However, children who were concerned their parents may have died during the cyclone disaster were significantly more likely to have lower family resilience scores ($t = 2.663$, df 407, $p = 0.008$).

Modelled relationships between post-disaster PTSD and family resilience

In this sample, the previously published relationships between event exposure, threat perception and post-disaster (severe-very severe) PTSD case status were replicated (see Table II, Model-1) providing evidence children's responses to this disaster were typical. For example there were significant odds ratios (adjusted for age and gender) for PTSD if the participant perceived they may have died during the cyclone (OR_{adj} 4.79, 95%CI 2.21, 10.43). There was no significant relationship between PTSD and previous mental health problem, duration of mental health problem, SDQ emotional health case status or family resilience (model II). Lower social connectedness was associated with PTSD case status (OR_{adj} 2.65, 95%CI 1.03, 6.85). SDQ emotional health case status was a trend (OR_{adj} 2.49, 95%CI 0.94, 6.55, p = 0.096). The final model included all variables significant at the p<0.10 level. In the final Model (Table II Model-3) PTSD case status was independently statistically associated with female gender, perceived threat to self and lower social connectedness. Duration of mental health difficulties was not significant. Family resilience did not independently contribute to the model (OR_{adj} 0.57, 95% CI 0.13, 2.44). Indeed, whilst the final model accounted for approximately 30% of the variance of PTSD case status (LR $\chi^2(7) = 69.91$, p=<0.0000, $R^2 = 0.305$), removal of the family resilience variable minimally changed the model R^2 (R^2 0.305 to R^2 0.299) and on a likelihood ratio test (model without family resilience nested within final model) there was no evidence that family resilience contributed to post-disaster PTSD (LR $\chi^2_1 = 1.79$, = 0.181).

This data does not provide evidence for a main effect for family resilience in predicting post disaster child PTSD. Effect modification was tested for family resilience and age, gender and threat perception by comparing crude and adjusted odds ratios. There was no effect modification of age by resilience (interaction term OR_{adj} 0.83, 95% CI 0.31-2.18, p = 0.700), gender (Test of homogeneity of ORs χ^2_1= 0.35, p = 0.552), or threat perception (Test of homogeneity of ORs χ^2_1= 0.87, p = 0.352). The argument that this community possibly had very high levels of resilience and a small spread of resilience scores that may explain the lack of resilience-PTSD association was tested by re-analysis using a more conservative resilience cut-off (lowest 10% versus other) and quadratic transformation of resilience scores. Again no significant association was found between family resilience and PTSD.

Discussion

PTSD causal models are conceptualised as multifactorial, encompassing both event-related and distal factors, the latter including both protective and vulnerability factors. Data from children who experienced Cyclone Larry replicated the importance of threat perception and exposure as well as a new protective factor, the child's report of their community connectedness (manuscript under review). In this study, we have expanded our conceptual model of PTSD to include family resilience and past history of mental illness. Low family resilience has been conceptualised as a child and adolescent mental health vulnerability factor. From a proof of concept perspective, consistent with past research, in this sample low family resilience was significantly associated with emotional problems on the SDQ and duration of mental health problems of 12 months or greater.

There is face validity that membership of a family with low resilience may confer a vulnerability to the child experiencing post disaster PTSD, through psychological processes including feeling less emotionally contained, more threatened, fearful, abandoned and unsupported or by a direct process such as high family resilience being associated with less direct exposure to the disaster. However, in this sample low family resilience was not related to post disaster child PTSD at bi-variate

analysis, as an independent contributor in a multivariate model or was there a relationship with event-related factors such as experiencing evacuation. Further, family resilience did not modify the effect of other significant factors such as the perception of threat to self. Whilst this finding needs replication our analysis suggests children with existing mental health problems and those of low resilience families are not at elevated risk of post disaster PTSD. Indeed our findings provide some evidence that the causal model of child PTSD may differ from the usual aetiological conceptualisation of child and adolescent mental health. The subgroup of children with existing mental health problems may not be an at risk group, rather all children, but especially females, may be vulnerable to post-disaster PTSD given sufficient exposure and perception of threat to self. The relationship of social connectedness to family resilience and why connectedness but not family resilience was associated with post-disaster PTSD requires further investigation. Our results raise two questions. Is family resilience unrelated to PTSD in children following natural disasters or is our understanding of the aspects of family functioning that constitute resilience still require further clarification? This sample is highly skewed toward the well functioning end of the scale, which may have limited the scale's usefulness. Indeed for both the parent-report measures reported in this study, the SDQ-EM and FRM, the mean scores in this sample were lower (i.e. more normal) than published norms. It may be that surviving a disastrous event may lead to a systematic reporting bias where parents consider aspects of child and family functioning more normal. Further research is needed to refine and test available measures of family resilience against the theoretical models proposed and demonstrate real world applicability.

There are limitations to this study; our "off the shelf" measure of family resilience and its lack of relationship with post disaster symptoms does not preclude other family factors being identified, such as parenting style and parent mental health factors that may contribute to a model of child post disaster PTSD. Comprehensiveness of the causal model being investigated in the post disaster scenario is always a challenge. Individuals, especially parents, are rightly focused on returning family life to normal and contending with the hierarchical needs of adequate shelter and safety for family

members rather than being engaged in research. Further, research is relatively sparse considering factors that post date rather than pre date the disaster.

In this study, the measure of family resilience focused on the families' ability to deal with adversity. The drive to researching this area is to identify factors that may confer resilience and therefore could be employed as preventative interventions in disaster prone areas. Future research directions should focus on alterative aspects of family and parent functioning that are hypothesised as independent contributors and these may include: a family history of anxiety disorders, past parental traumatic experience and abnormal family functioning. Research is also required to investigate whether family resilience may be a predictive factor for medium and long term psychosocial functioning or relate to treatment adherence and outcome.

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Table I: Bivariate associations with family resilience.

	Total score Mean (SD)	statistic	Degree freedom	p
Gender: male	40.66 (0.31)			
female	39.92 (0.28)	t = 1.75	439	0.081
Year level: 4	40.36 (4.09)			
5	40.11 (4.23)			
6	40.72 (4.27)			
7	39.81 (4.91)	F = 0.892	3	0.446
Social Connectedness				
Normal	40.58 (0.22)			
Low	39.10 (0.89)	t = 2.068	374	0.039
Mental health difficulty				
No	40.44 (0.23)			
Yes	39.44 (0.62)	t = 1.757	411	0.079
Duration difficulty				
none	41.22 (3.81)			
<1/12	40.69 (3.90)			
1-5/12	39.02 (4.62)			
6-12/12	38.62 (4.70)			
>12/12	39.85 (5.44)	F = 5.801	408	0.000
Evacuated:				
No	40.14 (0.24)			
Yes	41.50 (0.62)	t = 2.413	378	0.016
Perceived threat				
To self: No	40.29 (0.25)			
Yes	40.10 (0.43)	t = 0.367	407	0.714
To family: No	40.65 (0.24)			
Yes	39.42 (0.44)	t = 2.663	407	0.008
PTSD: not severe	40.22 (0.22)			
very severe	40.45 (0.56)	t = -0.340	439	0.734
SDQ Emotional subscale				
Non case	40.48 (0.22)			
Case	48.60 (0.66)	t = 2.919	425	0.003

Table II: Logistic regression: Multivariate relationships with child PTSD

	Model-1 OR (95% CI)	Model-2 OR (95% CI)	Model-3 OR (95% CI)
Gender	**4.67***** (2.09, 10.40)	**8.46***** (2.85, 25.10)	**8.73***** (2.45, 31.16)
Age	0.80 (0.62, 1.03)	**0.71*** (0.51, 0.97)	0.72 (0.49, 1.04)
Home damage	1.91 (0.85, 4.24)		
Threat to self	**4.79***** (2.21, 10.43)		**6.98***** (3.03, 16.05)
Threat to family	1.89 (0.86, 4.13)		
Previous difficulties		0.75 (0.16, 3.61)	
Difficulties >12 months		1.22 (0.19, 7.72)	
SDQ 'case'		2.49 (0.94, 6.55)	1.50 (0.88, 2.57)
Low connectedness		**2.65*** (1.03, 6.85)	**3.80*** (1.01, 9.73)
Family resilience		0.43 (0.11, 1.63)	0.57 (0.13, 2.44)

Significance: odds ratios in bold, 95% CI do not include 1.00 and *** p<.001, ** p<.01, * p<.05.
Model 1: Threat and exposure factors
Model 2: Mental health, social connectedness and family resilience factors
Model 3: (final) all model 1 and 2 variables with p<0.10